

## Inverter Grade Thyristors (Hockey PUK Version), 370 A



TO-200AB (A-PUK)

### FEATURES

- Metal case with ceramic insulator
- All diffused design
- Center amplifying gate
- Guaranteed high dV/dt
- International standard case TO-200AB (A-PUK)
- Guaranteed high dI/dt
- High surge current capability
- Low thermal impedance
- High speed performance
- Designed and qualified for industrial level
- Material categorization: For definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS  
COMPLIANT**

### PRODUCT SUMMARY

Package	TO-200AB (A-PUK)
Diode variation	Single SCR
$I_{T(AV)}$	370 A
$V_{DRM}/V_{RRM}$	1000 V, 1200 V
$V_{TM}$	1.72 V
$I_{TSM}$ at 50 Hz	5260 A
$I_{TSM}$ at 60 Hz	5510 A
$I_{GT}$	200 mA
$T_C/T_{hs}$	55 °C

### TYPICAL APPLICATIONS

- Inverters
- Choppers
- Induction heating
- All types of force-commutated converters

### MAJOR RATINGS AND CHARACTERISTICS

PARAMETER	TEST CONDITIONS	VALUES	UNITS
$I_{T(AV)}$		370	A
	$T_{hs}$	55	°C
$I_{T(RMS)}$		700	A
	$T_{hs}$	25	°C
$I_{TSM}$	50 Hz	5260	A
	60 Hz	5510	
$I^2t$	50 Hz	138	kA <sup>2</sup> s
	60 Hz	126	
$V_{DRM}/V_{RRM}$		1000 to 1200	V
$t_q$	Range	20 to 30	µs
$T_J$		-40 to 125	°C

### ELECTRICAL SPECIFICATIONS

#### VOLTAGE RATINGS

TYPE NUMBER	VOLTAGE CODE	$V_{DRM}/V_{RRM}$ , MAXIMUM REPETITIVE PEAK VOLTAGE V	$V_{RSM}$ , MAXIMUM NON-REPETITIVE PEAK VOLTAGE V	$I_{DRM}/I_{RRM}$ MAXIMUM AT $T_J = T_J$ MAXIMUM mA
VS-ST203C..C	10	1000	1100	40
	12	1200	1300	



CURRENT CARRYING CAPABILITY							
FREQUENCY							UNITS
50 Hz	860	750	1340	1160	5620	5020	A
400 Hz	840	706	1400	1220	2940	2590	
1000 Hz	700	580	1350	1170	1750	1520	
2500 Hz	430	340	980	830	910	780	
Recovery voltage $V_r$	50		50		50		V
Voltage before turn-on $V_d$	$V_{DRM}$		$V_{DRM}$		$V_{DRM}$		
Rise of on-state current $di/dt$	50		-		-		A/μs
Heatsink temperature	40	55	40	55	40	55	°C
Equivalent values for RC circuit	47/0.22		47/0.22		47/0.22		Ω/μF

ON-STATE CONDUCTION						
PARAMETER	SYMBOL	TEST CONDITIONS			VALUES	UNITS
Maximum average on-state current at heatsink temperature	$I_{T(AV)}$	180° conduction, half sine wave double side (single side) cooled			370 (140)	A
					55 (85)	°C
Maximum RMS on-state current	$I_{T(RMS)}$	DC at 25 °C heatsink temperature double side cooled			700	A
Maximum peak, one half cycle, non-repetitive surge current	$I_{TSM}$	t = 10 ms	No voltage reappplied	Sinusoidal half wave, initial $T_J = T_J$ maximum	5260	
		t = 8.3 ms			5510	
		t = 10 ms	100 % $V_{RRM}$ reappplied		4420	
		t = 8.3 ms			4630	
Maximum $I^2t$ for fusing	$I^2t$	t = 10 ms	No voltage reappplied		138	
		t = 8.3 ms			126	
		t = 10 ms	100 % $V_{RRM}$ reappplied		98	
		t = 8.3 ms			89	
Maximum $I^2\sqrt{t}$ for fusing	$I^2\sqrt{t}$	t = 0.1 to 10 ms, no voltage reappplied			1380	$kA^2\sqrt{s}$
Maximum peak on-state voltage	$V_{TM}$	$I_{TM} = 600$ A, $T_J = T_J$ maximum, $t_p = 10$ ms sine wave pulse			1.72	V
Low level value of threshold voltage	$V_{T(TO)1}$	$(16.7\% \times \pi \times I_{T(AV)}) < I < \pi \times I_{T(AV)}$ , $T_J = T_J$ maximum			1.17	
High level value of threshold voltage	$V_{T(TO)2}$	$I > \pi \times I_{T(AV)}$ , $T_J = T_J$ maximum			1.22	
Low level value of forward slope resistance	$r_{11}$	$(16.7\% \times \pi \times I_{T(AV)}) < I < \pi \times I_{T(AV)}$ , $T_J = T_J$ maximum			0.92	mΩ
High level value of forward slope resistance	$r_{12}$	$I > \pi \times I_{T(AV)}$ , $T_J = T_J$ maximum			0.83	
Maximum holding current	$I_H$	$T_J = 25$ °C, $I_T > 30$ A			600	mA
Typical latching current	$I_L$	$T_J = 25$ °C, $V_A = 12$ V, $R_a = 6$ Ω, $I_G = 1$ A			1000	



SWITCHING				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum non-repetitive rate of rise of turned on current	dl/dt	$T_J = T_J$ maximum, $V_{DRM} = \text{Rated } V_{DRM}$ $I_{TM} = 2 \times dl/dt$	1000	A/ $\mu$ s
Typical delay time	$t_d$	$T_J = 25^\circ\text{C}$ , $V_{DM} = \text{Rated } V_{DRM}$ , $I_{TM} = 50 \text{ A DC}$ , $t_p = 1 \mu\text{s}$ Resistive load, gate pulse: 10 V, 5 $\Omega$ source	0.8	$\mu$ s
Maximum turn-off time	minimum	$T_J = T_J$ maximum, $I_{TM} = 300 \text{ A}$ , commutating $dl/dt = 20 \text{ A}/\mu\text{s}$ $V_R = 50 \text{ V}$ , $t_p = 500 \mu\text{s}$ , $dV/dt$ : See table in device code	20	
	maximum		30	

BLOCKING				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum critical rate of rise of off-state voltage	dV/dt	$T_J = T_J$ maximum, linear to 80 % $V_{DRM}$ , higher value available on request	500	V/ $\mu$ s
Maximum peak reverse and off-state leakage current	$I_{RRM}$ , $I_{DRM}$	$T_J = T_J$ maximum, rated $V_{DRM}/V_{RRM}$ applied	40	mA

TRIGGERING				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum peak gate power	$P_{GM}$	$T_J = T_J$ maximum, $f = 50 \text{ Hz}$ , $d \% = 50$	60	W
Maximum average gate power	$P_{G(AV)}$		10	
Maximum peak positive gate current	$I_{GM}$	$T_J = T_J$ maximum, $t_p \leq 5 \text{ ms}$	10	A
Maximum peak positive gate voltage	+ $V_{GM}$		20	V
Maximum peak negative gate voltage	- $V_{GM}$		5	
Maximum DC gate current required to trigger	$I_{GT}$	$T_J = 25^\circ\text{C}$ , $V_A = 12 \text{ V}$ , $R_a = 6 \Omega$	200	mA
Maximum DC gate voltage required to trigger	$V_{GT}$		3	V
Maximum DC gate current not to trigger	$I_{GD}$	$T_J = T_J$ maximum, rated $V_{DRM}$ applied	20	mA
Maximum DC gate voltage not to trigger	$V_{GD}$		0.25	V

THERMAL AND MECHANICAL SPECIFICATIONS				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum operating junction temperature range	$T_J$		- 40 to 125	$^\circ\text{C}$
Maximum storage temperature range	$T_{Stg}$		- 40 to 150	
Maximum thermal resistance, junction to heatsink	$R_{thJ-hs}$	DC operation single side cooled	0.17	K/W
		DC operation double side cooled	0.08	
Maximum thermal resistance, case to heatsink	$R_{thC-hs}$	DC operation single side cooled	0.033	
		DC operation double side cooled	0.017	
Mounting force, $\pm 10 \%$			4900 (500)	N (kg)
Approximate weight			50	g
Case style		See dimensions - link at the end of datasheet	TO-200AB (A-PUK)	



$\Delta R_{thJ-hs}$ CONDUCTION						
CONDUCTION ANGLE	SINUSOIDAL CONDUCTION		RECTANGULAR CONDUCTION		TEST CONDITIONS	UNITS
	Single Side	Double Side	Single Side	Double Side		
180°	0.015	0.017	0.011	0.011	T <sub>J</sub> = T <sub>J</sub> maximum	K/W
120°	0.018	0.019	0.019	0.019		
90°	0.024	0.024	0.026	0.026		
60°	0.035	0.035	0.036	0.037		
30°	0.060	0.060	0.060	0.061		

**Note**

- The table above shows the increment of thermal resistance  $R_{thJ-hs}$  when devices operate at different conduction angles than DC

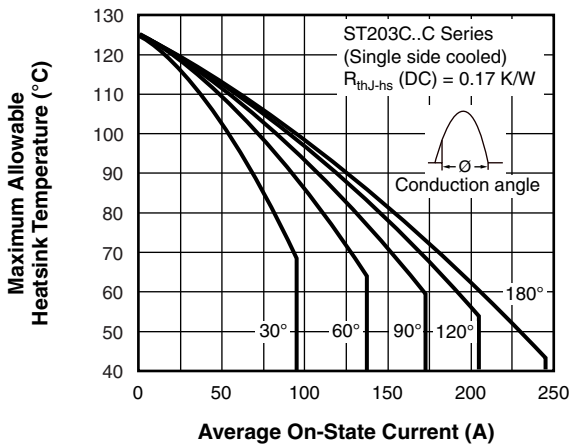


Fig. 1 - Current Ratings Characteristics

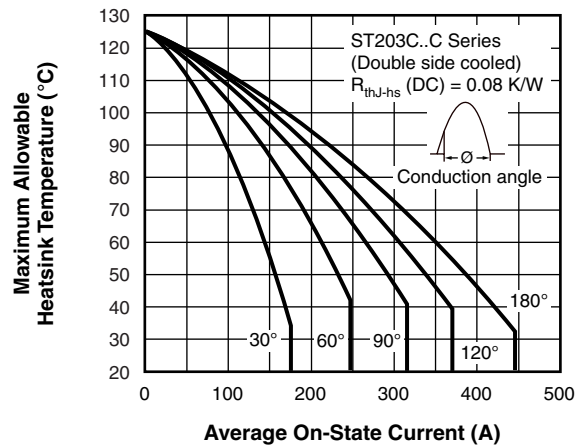


Fig. 3 - Current Ratings Characteristics

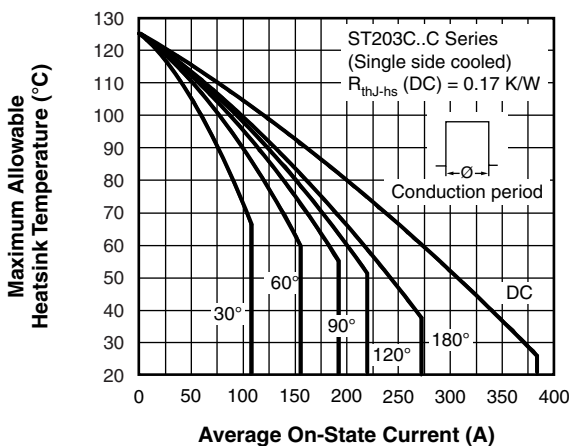


Fig. 2 - Current Ratings Characteristics

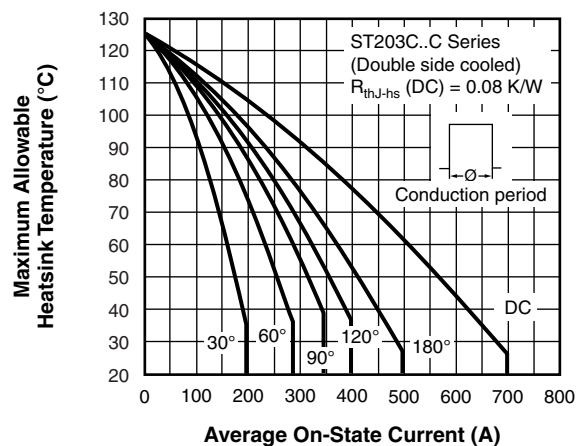


Fig. 4 - Current Ratings Characteristics

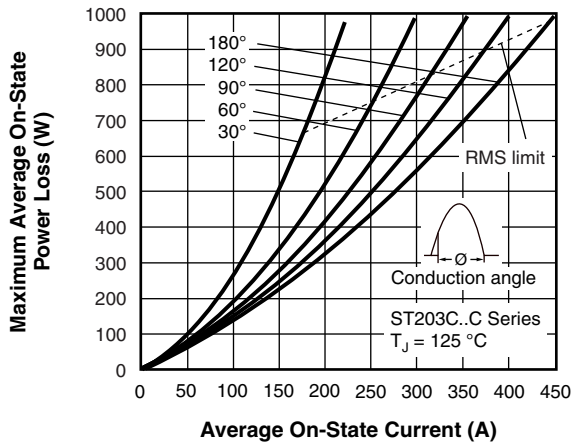


Fig. 5 - On-State Power Loss Characteristics

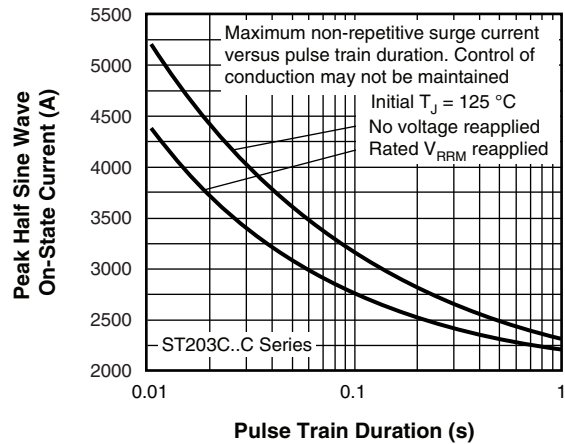


Fig. 8 - Maximum Non-Repetitive Surge Current Single and Double Side Cooled

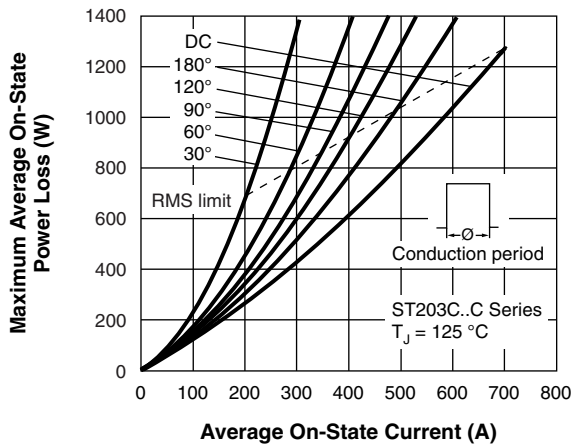


Fig. 6 - On-State Power Loss Characteristics

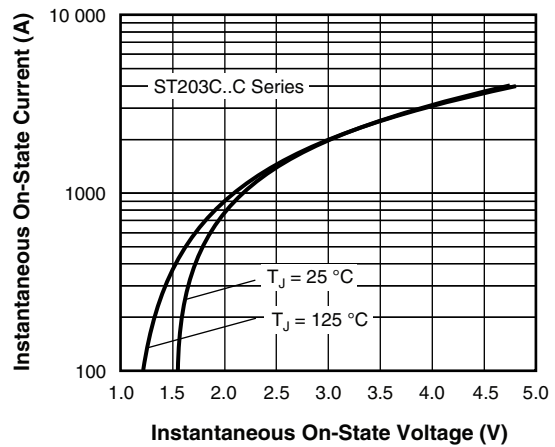


Fig. 9 - On-State Voltage Drop Characteristics

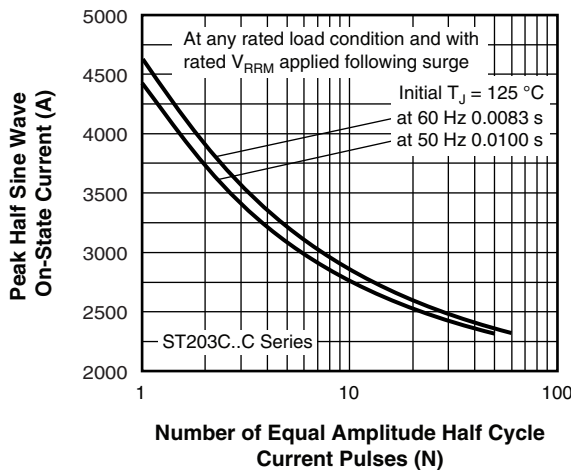


Fig. 7 - Maximum Non-Repetitive Surge Current Single and Double Side Cooled

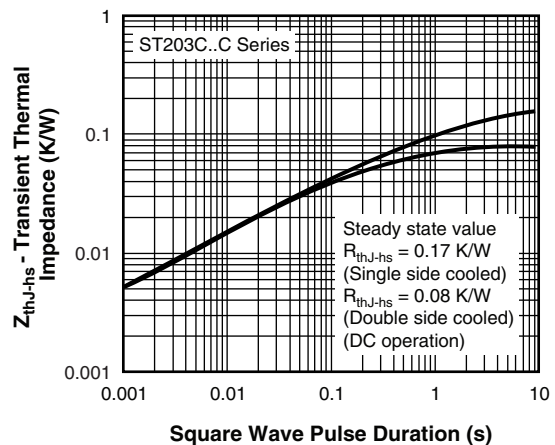


Fig. 10 - Thermal Impedance  $Z_{thJ-hs}$  Characteristics

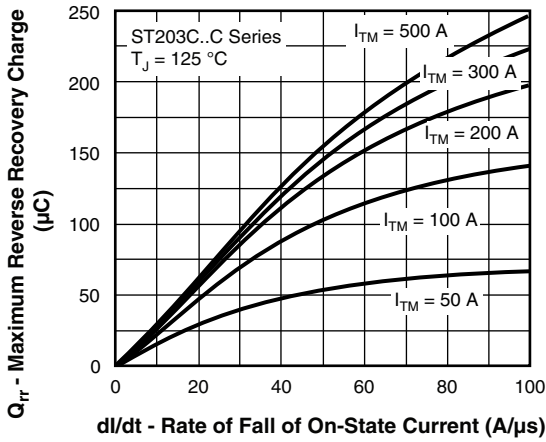


Fig. 11 - Reverse Recovered Charge Characteristics

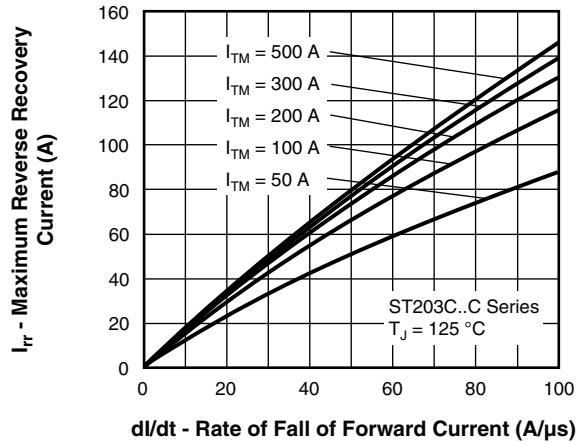


Fig. 12 - Reverse Recovery Current Characteristics

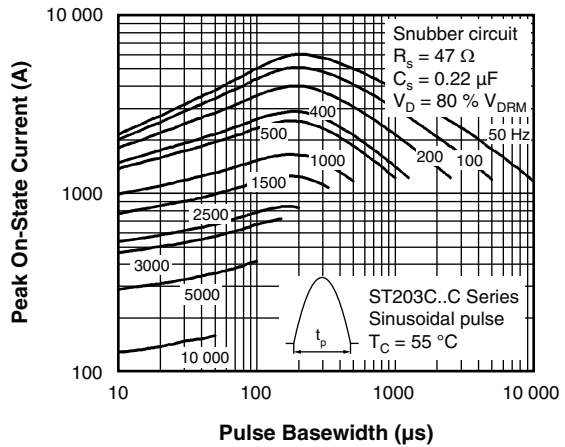
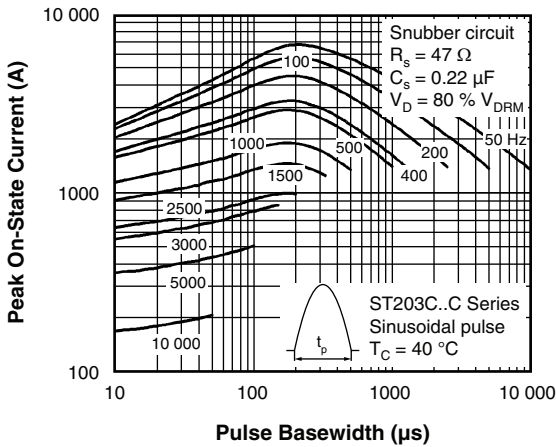


Fig. 13 - Frequency Characteristics

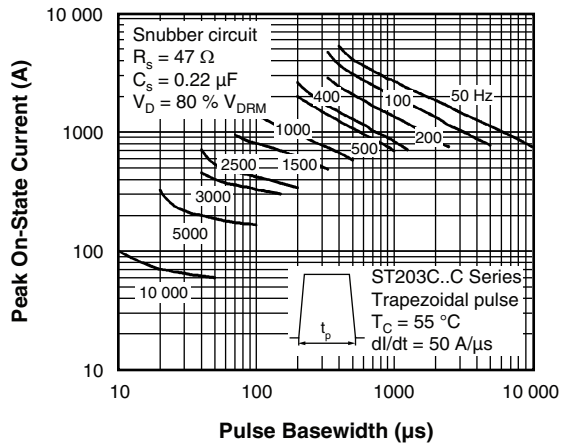
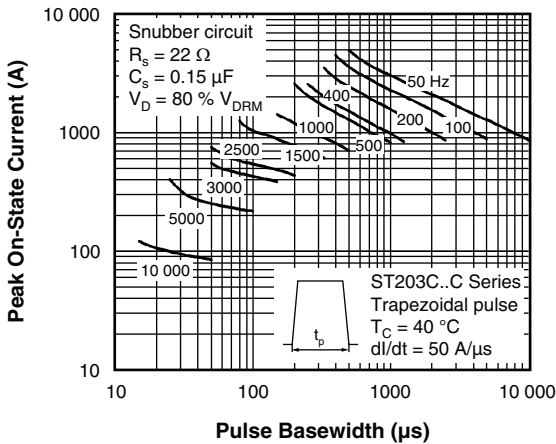


Fig. 14 - Frequency Characteristics

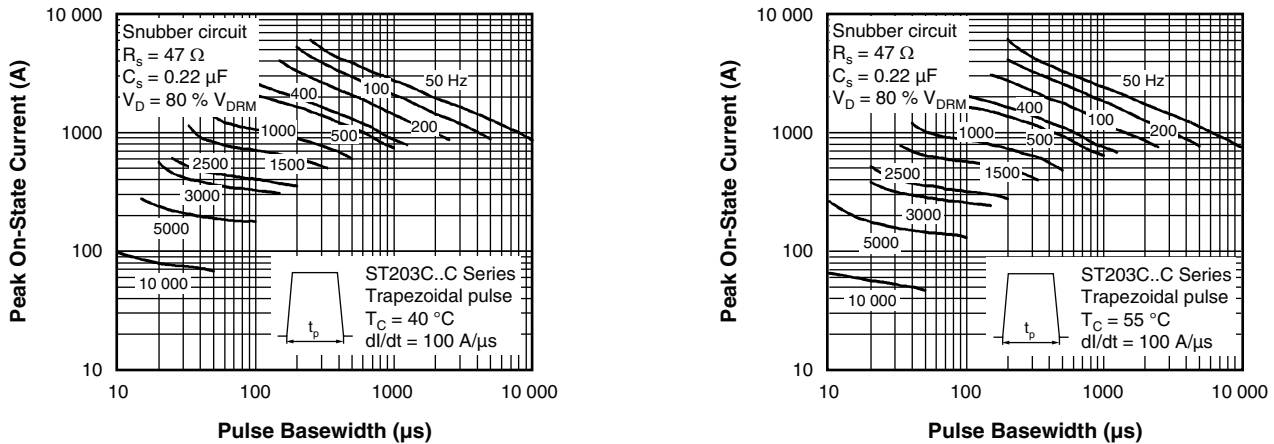


Fig. 15 - Frequency Characteristics

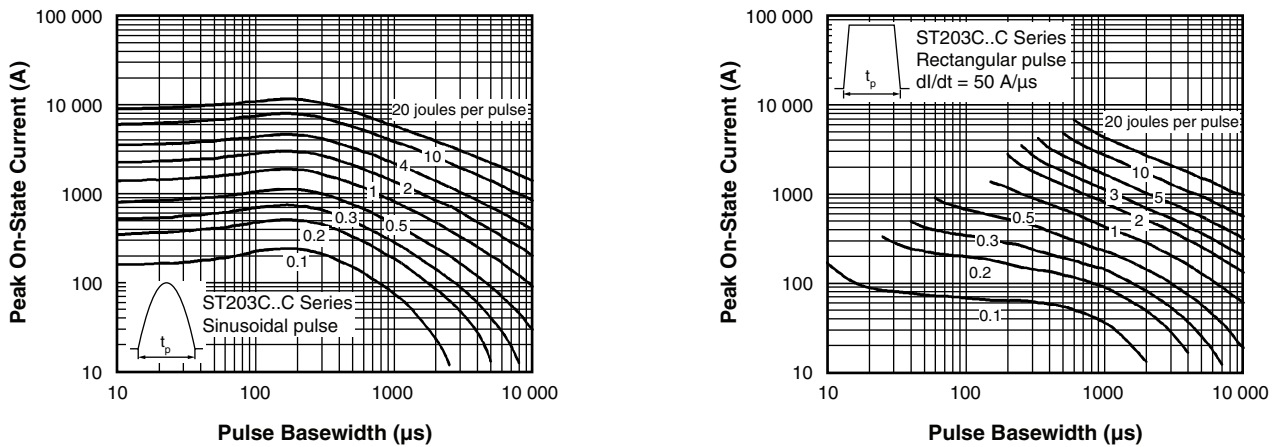


Fig. 16 - Maximum On-State Energy Power Loss Characteristics

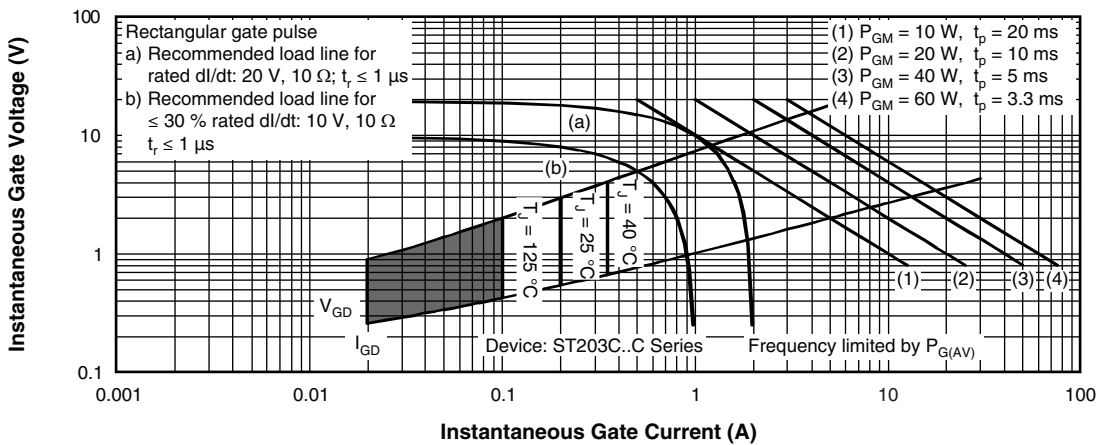
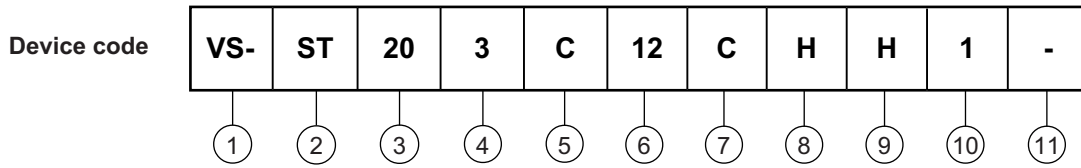


Fig. 17 - Gate Characteristics



**ORDERING INFORMATION TABLE**



- 1** - Vishay Semiconductors product
- 2** - Thyristor
- 3** - Essential part number
- 4** - 3 = Fast turn-off
- 5** - C = Ceramic PUK
- 6** - Voltage code x 100 =  $V_{RRM}$  (see Voltage Ratings table)
- 7** - C = PUK case TO-200AB (A-PUK)
- 8** - Reapplied dV/dt code (for  $t_q$  test condition)
- 9** -  $t_q$  code
- 10** - 0 = Eyelet terminals  
(gate and auxiliary cathode unsoldered leads)  
1 = Fast-on terminals  
(gate and auxiliary cathode unsoldered leads)  
2 = Eyelet terminals  
(gate and auxiliary cathode soldered leads)  
3 = Fast-on terminals  
(gate and auxiliary cathode soldered leads)
- 11** - Critical dV/dt:
  - None = 500 V/ $\mu$ s (standard value)
  - L = 1000 V/ $\mu$ s (special selection)

dV/dt - $t_q$ combinations available					
dV/dt (V/ $\mu$ s)	20	50	100	200	400
$t_q$ ( $\mu$ s)	CK	DK	EK	-	-
	CJ	DJ	EJ	<b>FJ*</b>	-
	CH	DH	EH	FH	HH

\* Standard part number.  
All other types available only on request.

LINKS TO RELATED DOCUMENTS	
Dimensions	<a href="http://www.vishay.com/doc?95074">www.vishay.com/doc?95074</a>



## TO-200AB (A-PUK)

### DIMENSIONS in millimeters (inches)

Anode to gate  
 Creepage distance: 7.62 (0.30) minimum  
 Strike distance: 7.12 (0.28) minimum



Quote between upper and lower pole pieces has to be considered after application of mounting force (see thermal and mechanical specification)



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- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



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